**Abstract**

A recently reported novel class of elastomers was tested with respect to its dielectric properties. The new elastomer material is based on a commercially available polydimethylsiloxane (PDMS) composition, which has been modified by embedding glycerol droplets into its matrix. The approach has two major advantages that make the material useful in a dielectric actuator. First, the glycerol droplets efficiently enhance the dielectric constant, which can reach very high values in the composite. Second, the liquid filler also acts as a softener that effectively decreases the elastic modulus of the composite. In combination with very low cost and easy preparation, the two property enhancements lead to a very attractive dielectric elastomer material. Experimental permittivity data are compared to various theoretical models that predict relative-permittivity changes as a function of filler loading, and the applicability of the models is discussed.

**Objectives**

The aim of this work was to use polar liquids as high-permittivity fillers for silicone elastomers. The liquid fillers were expected to act similarly to solid fillers and effectively enhance the dielectric constant of resulting elastomers.

**Results**

Main findings:
- The Young’s modulus of composites decreases with increasing glycerol loading yet the ultimate strain remains unaffected.
- Glycerol droplets distributed within PDMS act as high-permittivity filler enhancing the dielectric constant of resulting composites.
- The composites were assessed by means of some of the most popular theoretical models predicting changes of relative permittivities as a function of filler content. Results show that the formula suggested by Jayasundere and Smith fits the experimental results most accurately.

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**References**